



December 2018
Volume 16, number 4

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about cloud
measurement

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to be realized?

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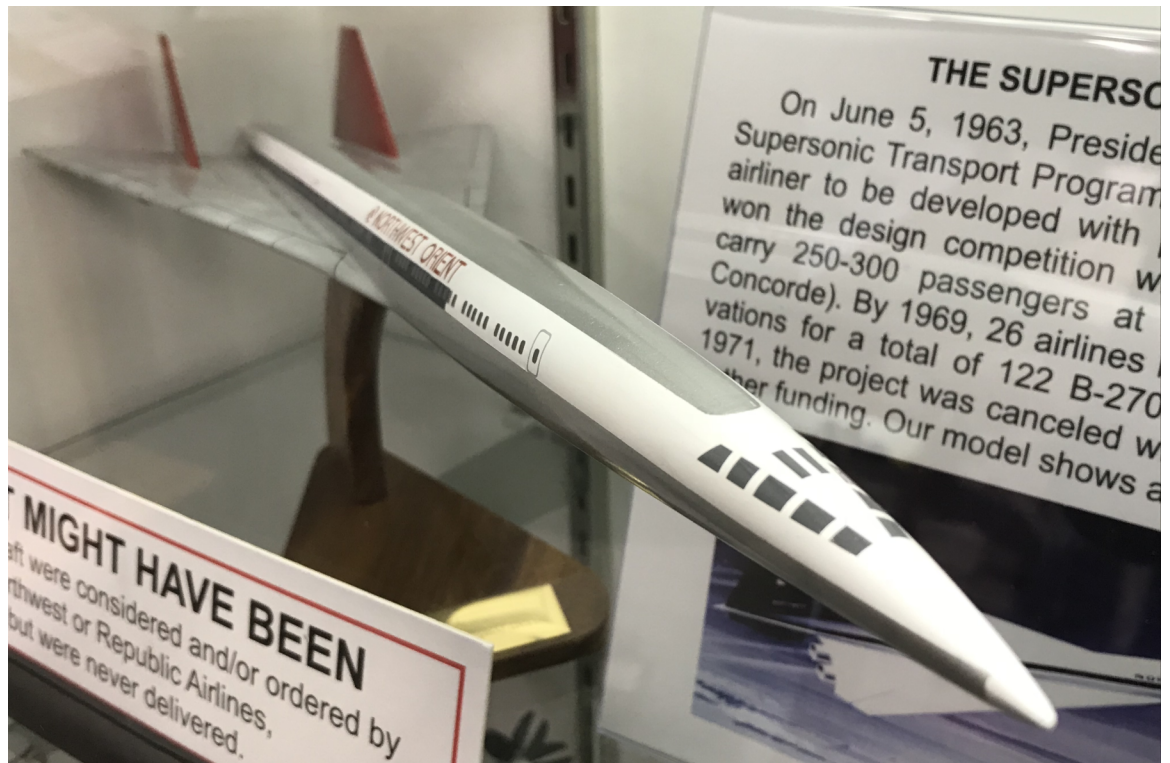
To preserve and
display the memory
of Northwest
Airlines' colorful
history.

To tell the stories of
carriers merged and
allied with NWA, and
the stations and
regions they served.

To show how the
legacy of NWA
carries on into the
future.

Reflections

The Quarterly Journal of the Northwest Airlines History Center



Supersonic Speculation!

How would NWA have actually used a High-Speed Civil Transport?

--by Scott Norris

One of the first model aircraft you'll come across in the newly-reopened NWAHC Museum is a needle-nosed, twin-tailed, lovingly kitbashed creation, donated by NWA's flight dispatchers. Part Lockheed L2000, part Boeing 2707, with engine pods from a B-58 Hustler, this sharp simulation was inspired by real conversation going on at Minneapolis headquarters in the mid-1980s.

Access to and the control of low-Earth orbit space had been a building concern in military and political circles through the 1980s, especially with the 1983 proposals of the "Strategic Defense Initiative", and was brought into sharp focus after the US Air Force test in January 1984 of the ASM-135 anti-satellite (ASAT) missile, carried on an F-15. It was understood the Soviet Union was also working on a similar MiG-31 based ASAT system at the time.

The growing ability of US and Soviet militaries to destroy orbiting satellites contrasted with growing frustration about the expense of putting materials in orbit. The Space Shuttle system had proven by 1985 to be too complex to fly on a regular, high-utilization schedule, and the European Ariane rocket was still having teething troubles. The promise of low-cost orbital lift with reusable, high-frequency launch vehicles had been broken.

And then, on January 28, 1986, the Space Shuttle Challenger exploded at launch.

Supersonic: to page 8

Flight Plan

From the Executive Director



In my last President's Message, I remarked how quickly the first anniversary of our new location in the Crowne Plaza Aire rolled around. We still shake our heads in amazement at how well things are turning out for the Northwest Airlines History Center. To define "well", as an example, I want to share how our monthly visitor count has improved in 2018: Jan=151; Feb=116; Mar=177; Apr=175; May=253; Jun=183; Jul=174; Aug=168; Sep=193; Oct=94. **Any one month** this year (even October) has been greater than any previous year since 2013. Truly a remarkable trend for us. Museum membership, however, still hovers between 500 and 600. We sincerely appreciate your steadfast loyalty and thank you for supporting the work of the Northwest Airlines History Center, by joining, renewing – and with the holiday season approaching – considering a gift subscription to the NWAHC for airline family, airline friends, and airline geeks!

The students from the University of St. Catherine (St. Kate) are fantastic! I can't say enough about their enthusiasm and work. The premise of their working in our archive, in coordination with their study requirements, is to accelerate the entire process of cataloging our large collection. The 14 students are in what I call the "hunt & gather" stage. Individually, or in two small groups, they are going through each accession, searching for their assigned items - timetables, annual reports, photographs, negatives, service ware, books, posters, manuals, in-flight magazines, company newspapers, and insignia & pins. These items comprise the most frequently donated items; by gathering them together, the items can be compared, with the best, or noteworthy, examples taken into the museum's collection. In addition to knowing exactly what we have, it begins to reduce the total number of boxes we manage, freeing up valuable shelf space to properly store both the boxes we have yet to process and the items that are now indexed and available for use, be it in new displays or for research. The work these students are doing is putting our collection light-years ahead in terms of knowing what we have and beginning to take proper care of them.

---> next page

Have items you'd be interested in donating to the NWAHC?

Click the online form at our new website, or contact us at
bruce.kitt@northwestairlineshistory.org.



Now, shopping on Amazon helps the NWAHC! 0.5% of every sale is contributed when you shop via this link: smile.amazon.com/ch/41-2020975

THE NORTHWEST AIRLINES HISTORY CENTER, INC.

We are an independent, not-for-profit 501(c)(3) corporation registered in the State of Minnesota.

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Museum Director: [open]

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On another archive front, two retired F/A volunteers, Flo Dreyer and Karen Jensen, have sorted through all the Northwest Family stewardess and F/A uniforms we have. They have organized the uniforms by the dates worn, with each uniform-issued piece of apparel – and issued accessories – and what insignia were worn on the uniforms. Good uniform examples beyond the needs of our collection are being offered to other airline museums for their collections. Flo and Karen have similarly processed the pilots uniforms...thankfully there were fewer style changes!

Working at the speed of volunteers, we are getting the archive on as good a footing as the museum. We are looking forward to 2019 as the year we begin to deliver on the goal of changing displays in the museum. Stay with us, support us, and stop in to visit. The Northwest Airlines History Center is now in its 17th year and the future is looking better and brighter.

On behalf of all the volunteers, we wish everyone a peaceful and enjoyable 2019. CAVU.

Preflight Briefing



From the Editor

Following on to Bruce's column, the NWAHC website has been getting an under-the-hood tuneup by me in the past quarter, anticipating the results of our archiving index team. If you have been following our Facebook posts recently, you'll note our promotion of the new Digital Archive section, which currently houses the back-issues of REFLECTIONS, going back to 2010, and my personal passion, the ever-growing digitized archive of timetables for the whole Northwest Family of carriers (and even some friends like Mesaba and KLM.) While it's important to show source documents as part of our Museum exhibitions, it's important to preserve them, too - so digitizing the collection and posting them all online is a solution that serves the interests of researchers, retirees, and the general public.

200 timetables are already posted, including the complete run of Air West, as well as a substantial number of Wisconsin Central, North Central, Mesaba, and Northwest issues. I'm working my way backwards through Hughes Airwest right now and have already posted every issue from 1976-1980, adding more every week. My friend and REFLECTIONS contributor Arthur Na is also helping in this endeavor, as the two of us are using our own big timetable libraries to jump-start the project.

In this issue, I'm using that #avgeek love of timetables in a different way to create and critically examine an alternate history where Ronald Reagan's vision of a hypersonic "Orient Express" actually happened. Keep your tray tables up, though, because it would have been a short ride both in block time and in cash flow!

My best wishes to you for the New Year. Cross-check and prepare for departure. --Scott

VISITING THE MUSEUM

Current schedule:

Wednesday - Thursday	11 am - 6 pm
Friday-Saturday	11 am - 5 pm
Closed Sunday-Tuesday, and major holidays.	

Admission is FREE

(Special events may incur a charge.)

Directions:

FROM MSP INTERNATIONAL AIRPORT:

Use the Metro Blue Line light rail from either Terminal 1 or Terminal 2. Take the southbound train (towards the Mall of America) and exit at the American Boulevard station, which is the stop immediately beyond Terminal 2. The Crowne Plaza Aire Hotel is immediately east, across the street from the station. Trains run every 10 minutes and fares are \$2.50 peak / \$2.00 off-peak. A ticket is good for 2.5 hours of unlimited travel, so depending on the length of your visit to the museum, a separate return ticket may not be necessary.

FROM THE TWIN CITIES METRO AREA:

Head toward MSP International Airport.

From I-494, get off at the 34th Ave. S. exit (second exit east of Hwy 77/Cedar)

Go south on 34th Ave. S. for one block to American Blvd.

Turn left onto American Blvd.

Crowne Plaza Aire Hotel is on your right. Free parking is available on the top two floors of the hotel's ramp.

The museum is on the third floor, across from the Fitness Center.

ANNUAL MEMBERSHIP

\$30 level - receives the REFLECTIONS digital edition early access via email

\$35 level - also receives the REFLECTIONS print edition via U.S. Postal Service

Compass Readings

Shanghai link next for MSP?

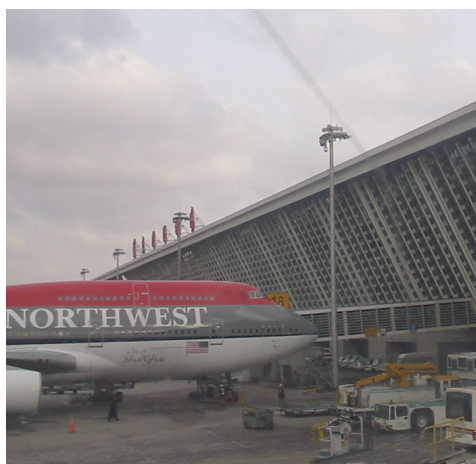
NWA first began service to Shanghai on July 15, 1947 via the Canadian inland route from Minneapolis to Anchorage and Tokyo. This service lasted less than two years because of the Communist takeover, and did not resume until May 2, 1984.

Northwest and now Delta have served the city continuously since then, and Delta has invested in local carrier China Eastern as part of their global equity strategy (going beyond SkyTeam affiliation.) DL currently flies from Shanghai's Pudong airport to Tokyo Narita, Detroit, Atlanta, Seattle, and Los Angeles.

Delta has asked the US DOT for spare Chinese Tier 1 flying rights abandoned by United, Hawaiian, and American to enable it to start MSP-PVG nonstops in Spring 2020 using new Airbus A350-900 equipment.

This link was of course one of Northwest's intended routes for their never-realized fleet of 787-8 Dreamliners.

If approved, the MSP-PVG link will follow the introduction of MSP-Seoul Incheon service in April 2019.



N674US "City of Shanghai" at PVG, Jan 5, 2006. Image by Kubicwave via Chinese Wikipedia, CC 3.0 license.



Ceilometer – Early Weather Instrument Used at MSP

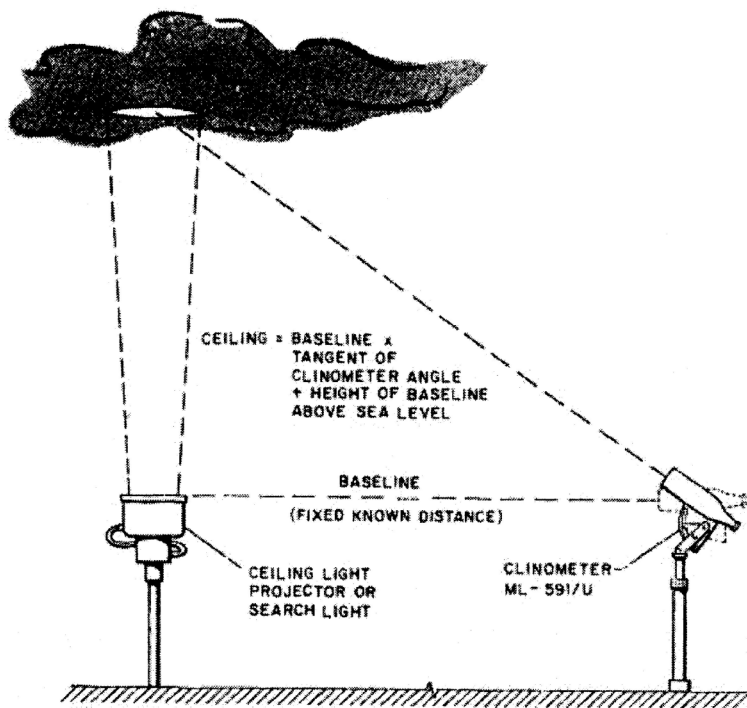
--by Noel Allard, Minnesota Aviation Hall of Fame (nallard@unitelc.com)

I'd like to take you on a nostalgia trip back to the early days of the Minneapolis-St. Paul International Airport (MSP). Back to the days when everybody knew it as Wold-Chamberlain Field. (It actually still is!) Most folks in the Minneapolis area have probably forgotten that 34th Avenue used to run continuously past the front door of the Wold-Chamberlain terminal building. Maybe also forgotten is the row of hangars that fronted 34th Avenue. Long gone is the tall monster hangar built by the Navy for electrical research in 1944 that dominated the far northwest end of the airport. Shorty De Ponti leased that hangar after the war and IFT Instrument Training officed there. At that corner of the airport was probably the best place a young guy could go to watch airplanes in the 1950s. Parking lots left plenty of room just outside the simple chain-link security fence for airplane buffs like myself to camp with our bicycles and a sandwich, and take a roll of pictures with a Kodak Brownie camera. In my earliest days, that meant watching post-WWII era Navy Reserve Hellcat, Corsair and Avenger pilots getting in their required hours shooting repeated landings on old runway 9L.

Also at that corner, in front of the parking lots on the airport side of 34th, resided a Northwest maintenance building called the "Pig Pen" where engine oil was changed and planes washed down. By the side of the maintenance building there was a strange looking device that piqued my interest for years until I happened to be parked in one of the lots with a date after dark one night. I saw a solid shaft of light projected vertically out of the device skyward, and looking up, I could see the spotlight illuminating the base of the local cloud deck. Aha! The device was an instrument for determining the cloud base for the field weather bureau, which relayed the information to approaching aircraft.

Recently, I unearthed photos I had taken of the device, properly called a Ceilometer. The official Government title of it was ML-121 Ceiling Light Projector, part of a set which included a Clinometer Model ML-591/U for sighting the height of the beam. The light projector, (Ceilometer) was used at night either periodically in good weather, or continuously in cloudy or stormy weather, projecting its light vertically, like a searchlight capped at the cloud base by a bright illuminated spot.

The Wold-Chamberlain weather station in those days was located on the third floor of the old terminal building. The Clinometer was mounted on a stairway landing that led to the roof of the terminal. The Clinometer, which was simply a small telescopic sight, focused out a window into which an operator peered and centered crosshairs on the light spot on the clouds overhead. A weighted pointer below the eyepiece pointed to a scale on which was a mounted protractor. Knowing the base distance from the light source formed three sides of a triangle from the source to the cloud and back to the operator. The degrees indicated on the protractor solved the simple Pythagorean math that gave the vertical height of the light beam, and thus, the height to the cloud base over the airport. The distance from the light source to the Clinometer eyepiece was recommended to be 800 feet, although alternate observation points were sometimes established at 400 ft. or at 1,600 ft. The practical range of the light beam was from 400 ft. to 10,000 ft. altitude. Byron Paulson who worked in the tower in the late 1970s recalled the Clinometer being called "the old black coke bottle."



Recorded readings were kept in the event that an accident on the airport could be determined to have been caused by a low ceiling. The MSP weather bureau moved from the terminal building about the time the Ceilometer was decommissioned, to the second floor of a building alongside the terminal. That building was removed when a newer tower was built in the 1970s. The newer tower was then abandoned when the present tower was constructed in the late 1980s and early 1990s. The current airport weather bureau's report is a fixture on the nightly TV weather news. Lasers came into use in the 1970s and are used now for the same purpose as the Ceilometer with digital ceiling outputs to the tower and weather bureau.

Dan McDowell of MN/DOT Aeronautics Office related that when he worked at the Peoria Airport (PIA) many years ago, they had a Ceilometer as well and called it the "cloud base height thingy". A similar device was used by the Navy on shipboard. Operations described in Chapt 5. of the Aerographer's Mate Manual from the US Navy, 1976. (See illustration).

The light was commissioned in the late 1930s and was removed from service between 1963 and 1973. Pictures show it capped and still on the field in 1978 (Tom Fahey). I am hoping to find out more about the light itself, such as the wattage and size of bulb. If anyone that reads this has further information, please contact me.

Thanks for information from Jeff Hamiel, Tom Fahey, William Gough, Byron Paulson, Terry Love and Dan McDowell.

October Airliner Show Photos

Great to see growing attendance and participation! And many thanks to David H. Stringer for his presentation on America's Local Service Airlines.



Center Spread: Northwest was pitched numerous proposals for supersonic and hypersonic aircraft. The NWAHC Archive is fortunate to have a set of technical and operational specifications for the Boeing 2707 project from 1966, running hundreds of pages and taking up several ringbound books!

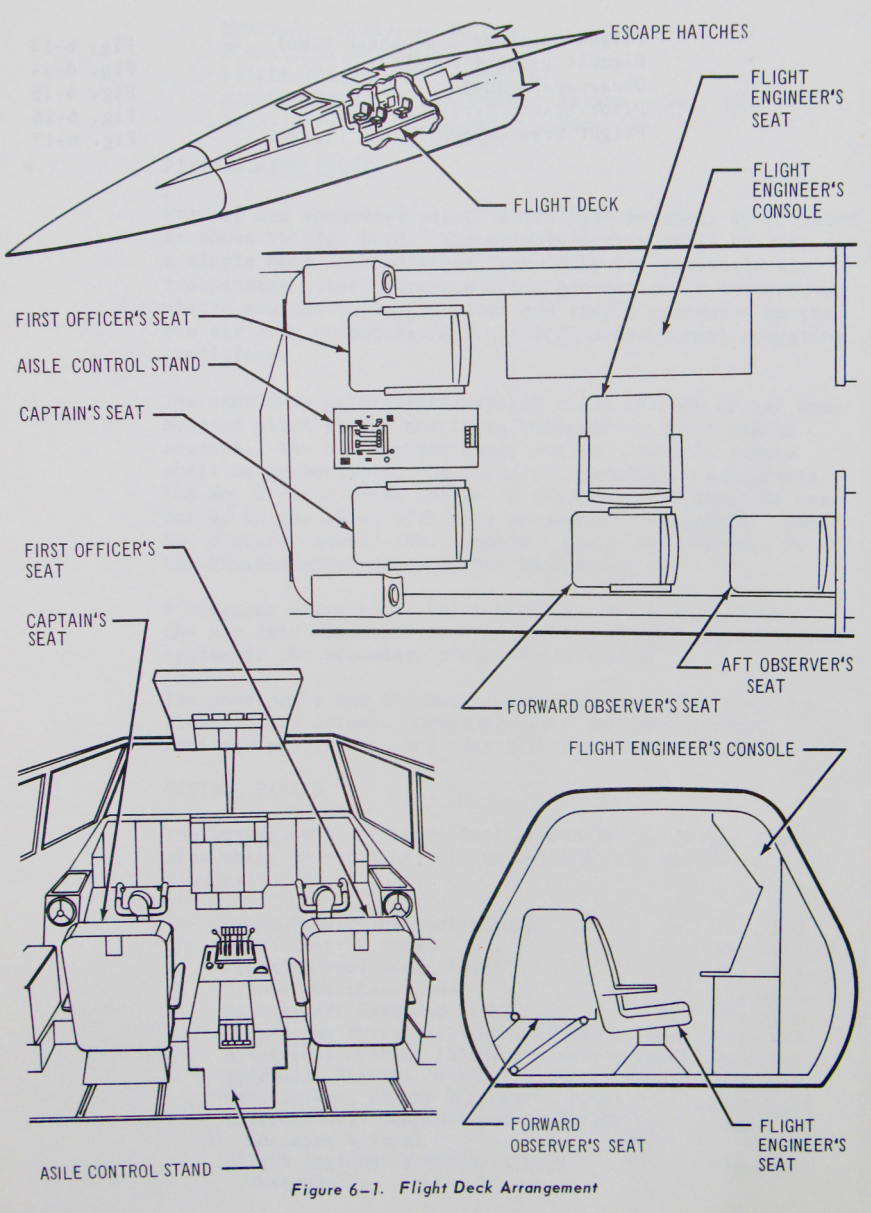
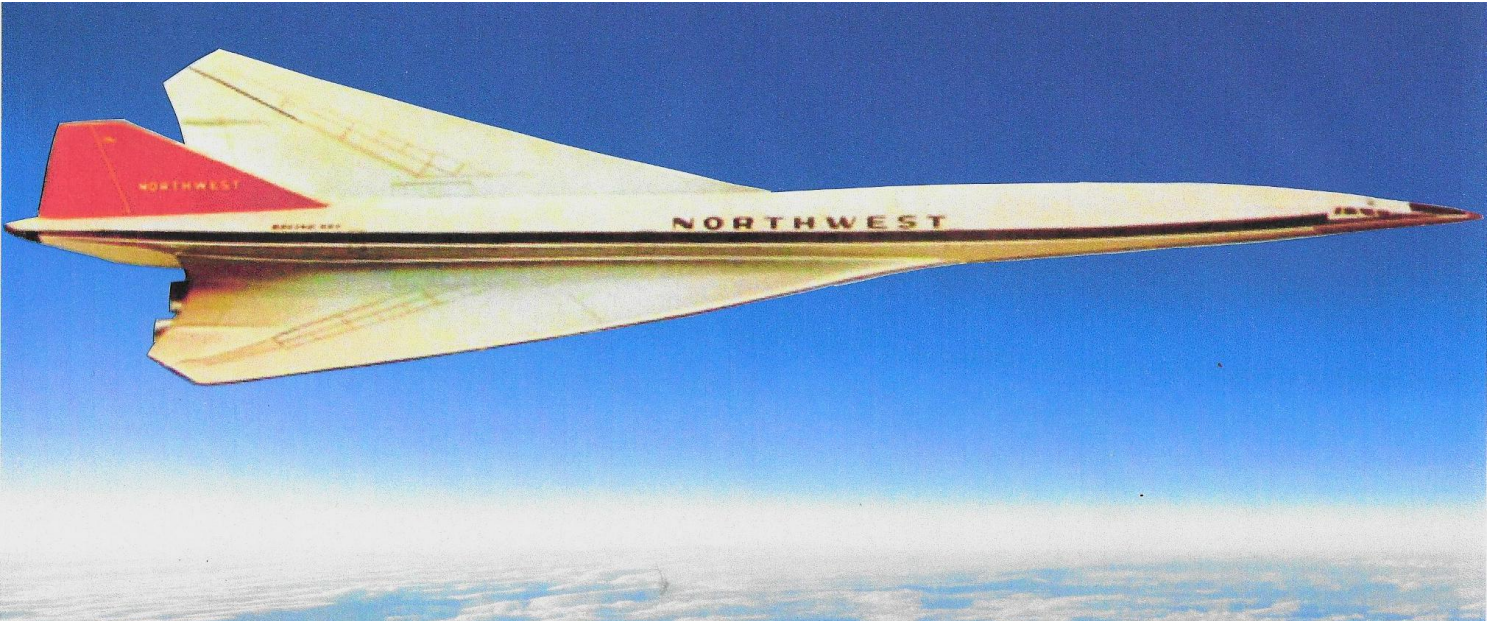
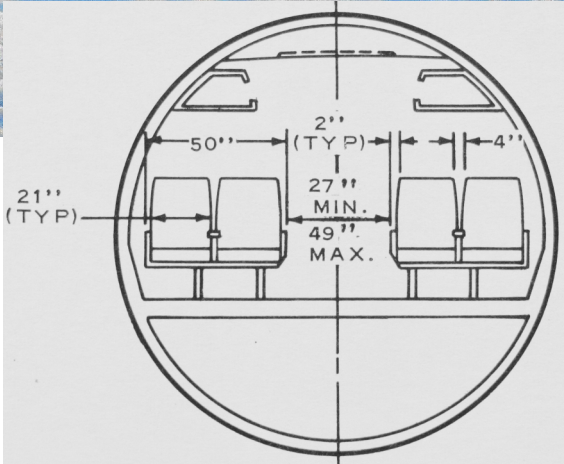


Figure 6-1. Flight Deck Arrangement



This early version of the 2707 was supposed to seat 277 passengers: 30 first class at a 40-inch pitch, and 247 tourist at a 34-inch pitch, using just a single aisle. Two boarding doors were to have been employed. If you think the 757-300 takes a long time to load, imagine it with 43 more pax! Fast turnarounds: not a design objective.

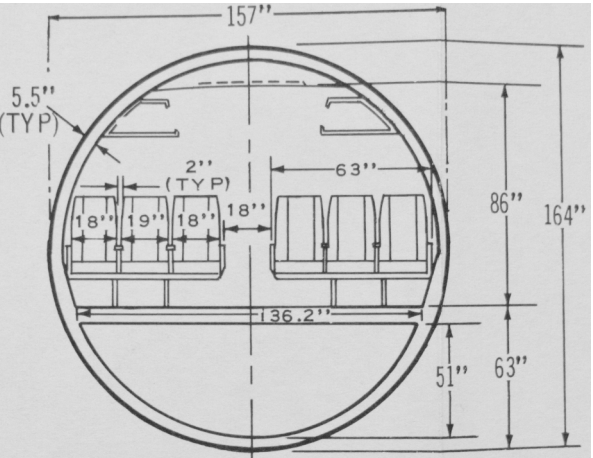


Figure 5-1 Inlet Arrangement

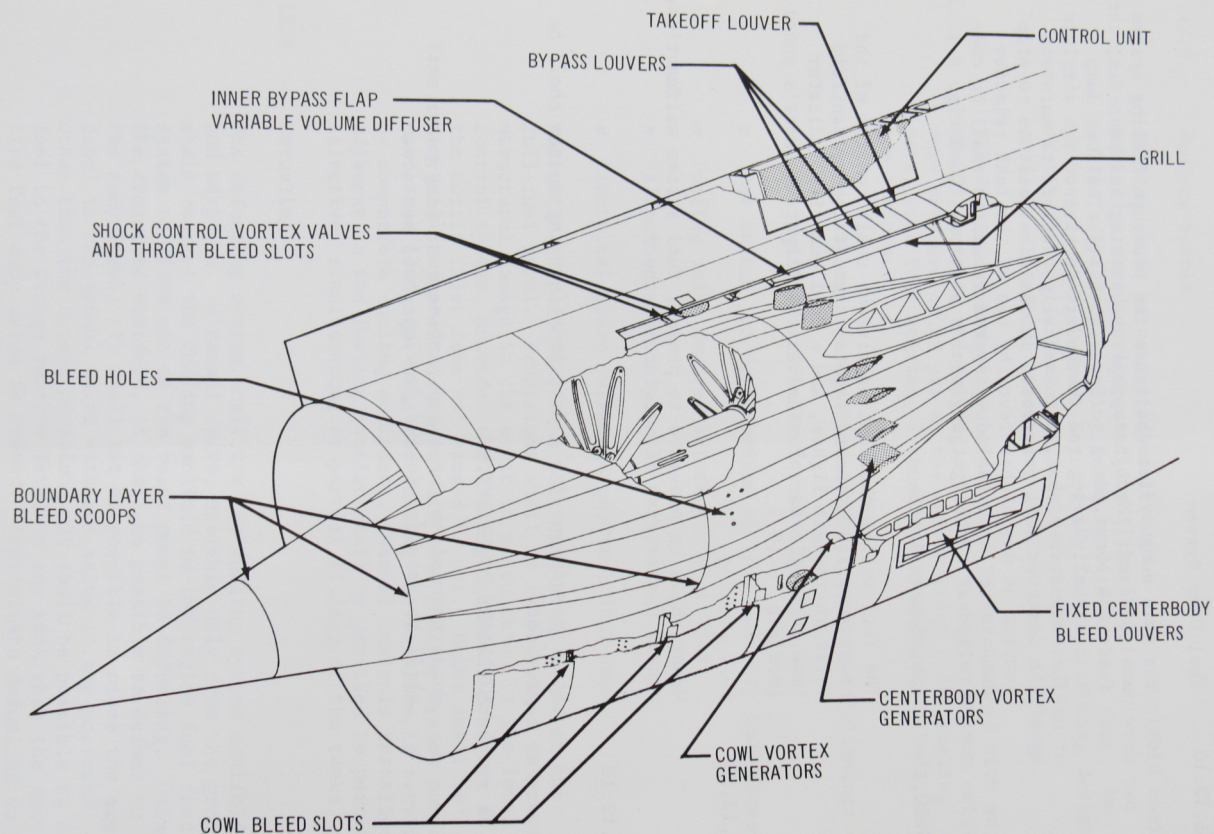
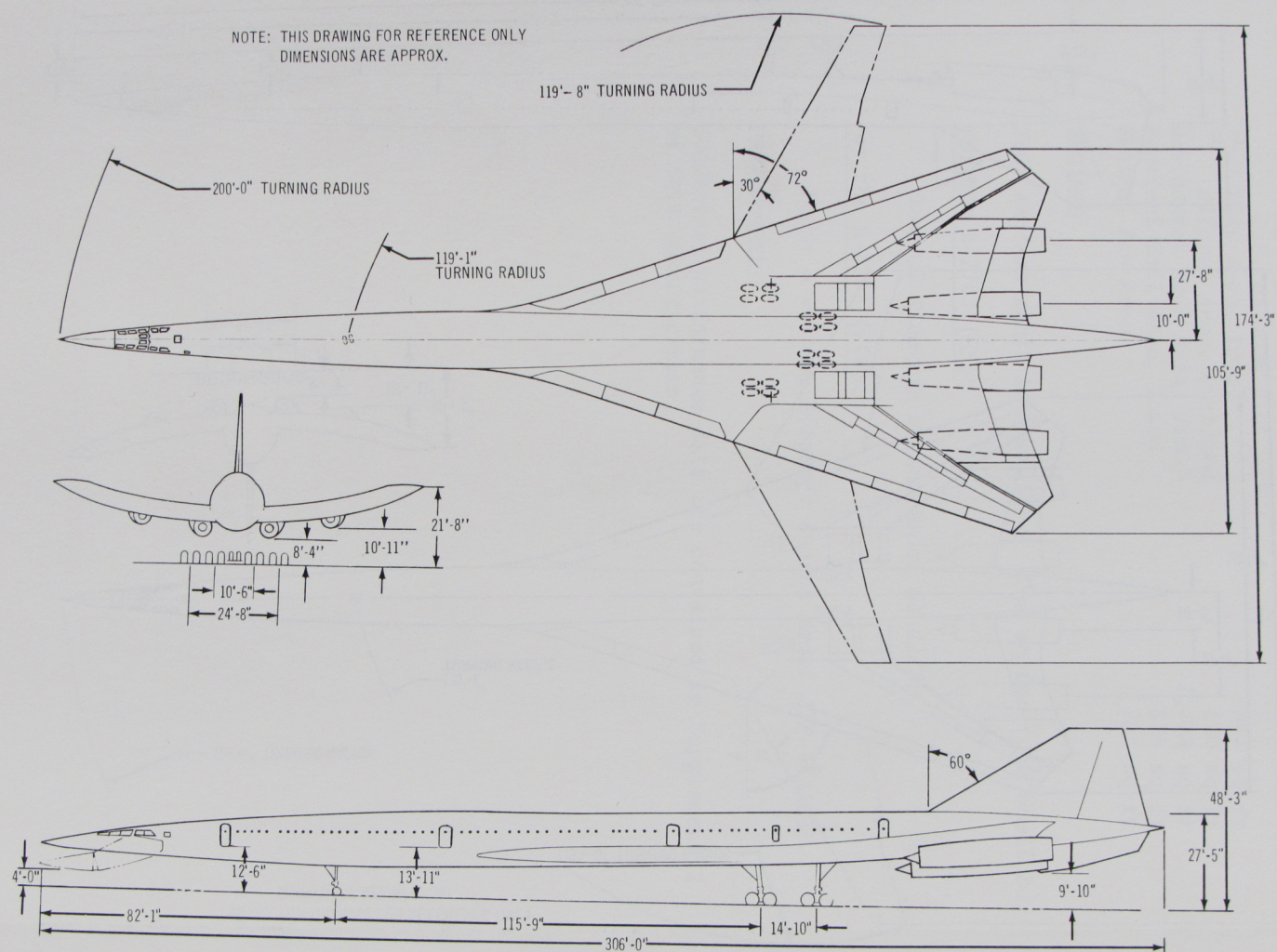


Figure 1-2 General Arrangement B-2707 (GE)

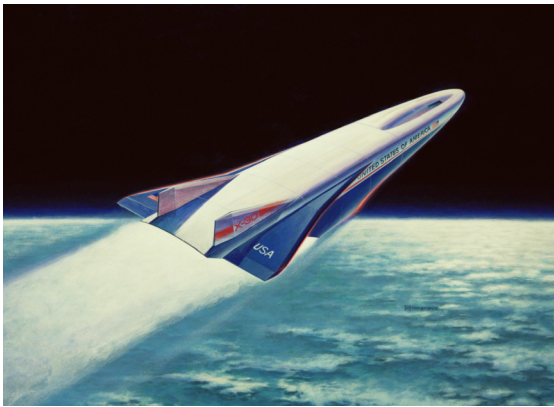


Feature Article



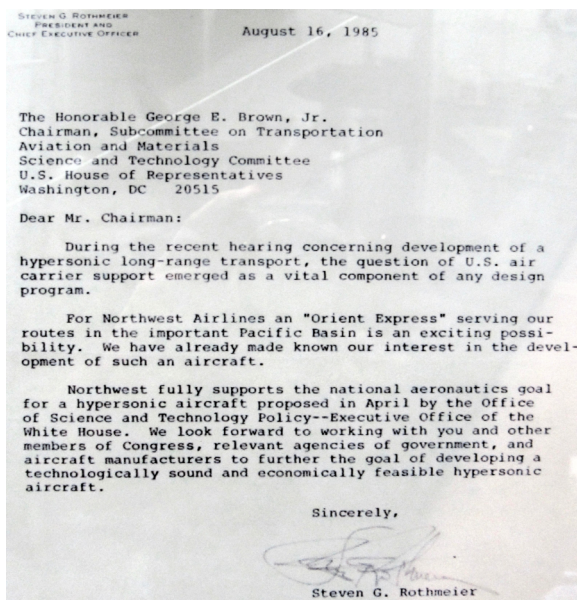
The shocking loss of the Challenger was viewed by millions on live TV.

Source: NASA



Artist's concept of the X-30 Space Plane.

Source: NASA



The subsequent investigation's revelations about booster rocket design, weather-safety protocols, and the decision-making process at NASA – combined with still-fresh memories of the severe recession of the early 1980s and the flight of factories offshore - shook the nation's faith in its industrial and technological prowess. More strategically, the U.S. was now severely limited in heavy-lift orbital capability. A breakthrough was needed, not just to establish a secure launch capability, but to realize the commercial potential of near-Earth orbit (NEO) space.

The Aero-Space Plane

President Reagan postponed the 1986 State of the Union address to Congress in the wake of the Challenger disaster, and when he did deliver it, he sought to rally the country around a technological goal in the manner John F. Kennedy did with the Apollo Program: he set out the vision of "a new Orient Express, that could, by the end of the next decade, take off from Dulles Airport and accelerate up to 25 times the speed of sound, attaining low-Earth orbit or flying to Tokyo in two hours."

The National Aero-Space Plane project was swiftly funded through NASA, DARPA, and the Air Force and touched off basic and applied research on many fronts: materials science for handling the weight, stress, and heat such a vehicle would encounter; cryogenics to handle the liquid hydrogen and methane fuels; scramjet and other air-breathing engine designs; navigation and communications systems; human piloting factors; and so on.

While the Orient Express concept video shown to the public painted the aircraft in Air Force One colors, it was clear the project was intended to yield military technology first, with civilian applications afterward, just as the X-plane projects of the 1950s and 1960s had done. It was assumed the X-30 would be first translated into a strategic strike bomber and ASAT platform, operating in the Mach 5 range, and eventually a Space Shuttle replacement (called a Single Stage to Orbit vehicle, "SSTO") which could attain roughly Mach 20.

However, civilian-aviation payoffs looked very promising when viewed in the context of booming trans-Pacific trade. Northwest, especially, saw significant potential in a High-Speed Civil Transport (HST).

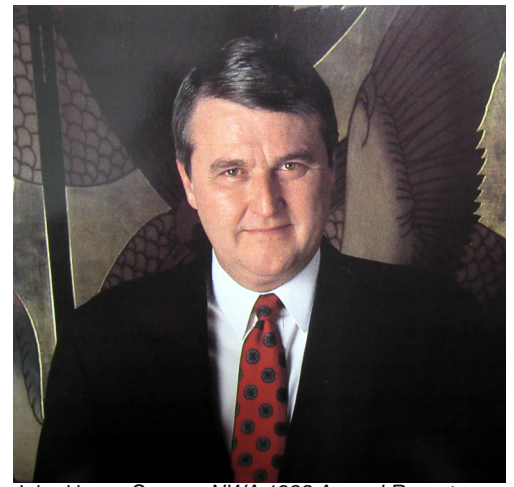
Northwest's Vision

In a speech to the High-Speed Commercial Flight Symposium in Columbus, Ohio, on October 22, 1986, John Horn, Northwest's President and Chief Operating Officer, remarked:

"Northwest Airlines is most interested in a commercial, methane-powered version that would cruise at a suborbital level of around 100,000 feet at speeds of Mach 5, or approximately 3,400 mph. Our support has not waned, although it is contingent upon the development of a cost-effective, commercially viable transport vehicle capable of providing both passenger and cargo service."



Artist's impression of the X-30 on re-entry to Earth. Source: NASA



John Horn. Source: NWA 1988 Annual Report

“Our 40 years of experience serving Asia tells us that a properly designed HST will be a very valuable asset to our airline and our customers well into the 21st century. The HST could truly revolutionize U.S.-Asia air travel, providing fast, comfortable and efficient customer service at prices reflecting the value received.

“The next aircraft serving Asian markets will be the 747-400, which will have greater payload and have a longer range – plus significant advances in technology. In about two years, Northwest will put into service the first 747-400 produced. Yet, projected demands for passenger and cargo services continue to call for faster, more productive aircraft.

“The next technological jump is to the HST, also called the Orient Express. To say that this vehicle would dramatically improve worldwide commercial air service is an understatement. We expect the Orient Express to have as dramatic an effect on air transportation as the introduction of jet aircraft or the introduction of the 747. Projected hourly operating costs of the Orient Express will be substantially higher than subsonic aircraft, but because of the productivity and speed of the aircraft, trip costs are expected to be relatively low. The result is that passenger and cargo fares on the Orient Express will be very competitive with the subsonic trans-Pacific fares of the day.”

Of course, it didn't happen like that

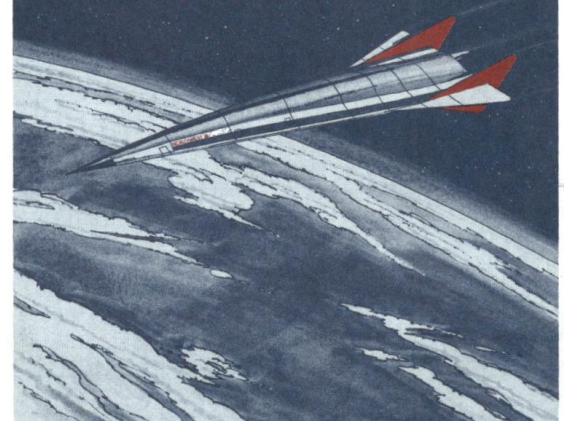
The technologies failed to mature, and by 1993 the program was formally ended after a reported \$1.6 billion had been spent (plus an unknown amount through “black budget” channels.) While the research program did jump-start advances in materials science and cryogenics, that knowledge was applied to conventional rocket platforms, leading to propulsion systems on Burt Rutan’s SpaceShip One suborbital rocket plane (using a mother-ship aircraft), and Elon Musk’s SpaceX Falcon-series self-landing reusable rockets.

Ironically, SpaceX forced orbital launch costs down by orders of magnitude – pushing the Russian space program out of commercial launches, and making ongoing SSTO development projects like Britain’s Skylon never capable of being profitably flown.

But let's speculate a commercial Mach 5 aircraft did get affordably developed and certified. How would Northwest use such a vehicle?



Into our future...



Northwest used this concept artwork in various marketing materials, such as ticket jackets.

Time for Timetables!

Let's make a few wild and unsupportable assumptions: that major world airports would be able to handle liquid-methane fuel storage and distribution, that liquid methane could be refined at a similar net cost as kerosene (and that it has no-worse environmental effects); the aircraft would have capacity similar to a 757 with adequate fuel stores to handle ultra long range flights; that it could integrate with regular air traffic during takeoff and landing; that its sonic boom characteristics were controlled enough to permit overland flying; and that a HST could be turned around in similar time to a 747-400. And let's say this vehicle was ready to fly for Northwest in 1994.

Let's also say each flight will need 15 minutes on each end for taxi, and will spend about 50 minutes in subsonic departure or approach traffic. We'll figure it will take about 30 minutes to ramp up to Flight Level 1000 and Mach 5 cruise, and 30 minutes to come down. It would need long runways and long approaches (ruling out Kai Tak airport in Hong Kong at the time.) And flights would still need to observe relevant airfield operating hours. So what would schedules and routings actually look like, once the fleet was up to full strength?

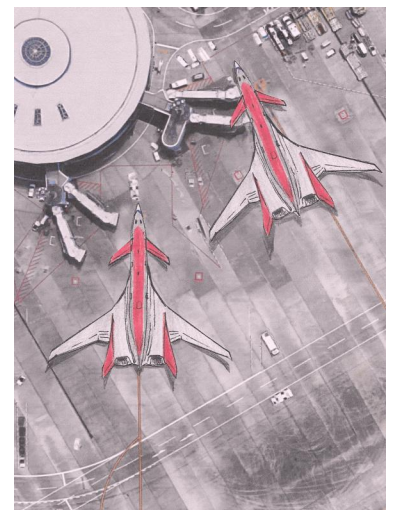


Narita is the Limiting Factor

Tokyo-Narita's curfew hours would have posed the critical challenge, not just for the HST itself but also because regional flights to and from places like Hong Kong and Shanghai would need to manage their own curfew hours. The earliest bank of regional flights would look like:

Hong Kong (still at Kai Tak Airport then): Depart 6:15 am – arrive NRT 10:55 am
Taipei: Depart 6:50 am – arrive NRT 10:45 am
Shanghai (still at Hongqiao Airport then): Depart 6:30 am – arrive 10:40 am
Beijing: Depart 6:00 am – arrive NRT 11:00 am

So Narita trans-Pacific departures would be able to block out at about 12:30 pm local time. Heading to New York JFK, at 6,745 Great Circle miles and the time assumptions given earlier, would block at roughly 3 hours 45 minutes. Detroit would block at 3:40, and Los Angeles at just 3:30.



Unfortunately, that means the JFK flight would arrive at 4:15 am, DTW at 4:10 am, and LAX at midnight; unacceptable for onward connecting traffic. One might leave LAX where it is, but shift the DTW and New York departures back two hours.

Would mid-morning departures at JFK, DTW, and LAX get into Tokyo around breakfast, so they could have minimal ground time? If the JFK departure was 9:00 am, NRT arrival would be at 01:45. The run from Detroit would arrive 5 minutes earlier. An 8 am LAX departure would get to Tokyo at 3:30 am. Those would all result in curfew violations.

To get into Tokyo around 8 am, New York and Detroit departures would have to push out at around 3 pm, and LAX would have to depart at 12:30 pm. This means our expensive HSTs would be sitting on the ground in America for half a day, and in Tokyo for up to six hours!

Los Angeles is Key to Utilization

While Narita induces long turnarounds, LAX and its wider window of operations (and its high Origin & Destination traffic potential) allows for a quick turn to Amsterdam with excellent connection timings, and out-and-back routings to Australia and Singapore. Seoul also proves to be a good routing to get the fleet between Los Angeles and Detroit. With line maintenance at LAX and Narita, and overhaul work likely done at Detroit, a 7-aircraft fleet could cover the map on the preceding page with this sequence:

Flight	Departing		Arriving		Block time	
829	DTW	13:00	SEL	05:40 next day	3 h 40	6 h 50 turnaround at DTW
824	SEL	09:00	LAX	20:30 previous day	3 h 30	3 h 20 turnaround at Gimpo
876	LAX	02:10	AMS	14:35 same day	3 h 25	5 h 40 turnaround at LAX
875	AMS	17:00	LAX	11:25 same day	3 h 25	2 h 25 turnaround at Schiphol
873	LAX	14:00	SYD	10:55 next day	3 h 55	2 h 35 turnaround at LAX
874	SYD	14:00	LAX	00:55 same day	3 h 55	3 h 05 turnaround at SYD
831	LAX	11:00	SIN	06:15 next day	4 h 15	10 h 05 layover at LAX
832	SIN	10:00	LAX	23:15 previous day	4 h 15	3 h 45 turnaround at Changi
801	LAX	12:30	NRT	08:00 next day	3 h 30	13 h 15 layover at LAX
818	NRT	14:30	JFK	05:15 previous day	3 h 45	6 h 30 turnaround at Narita
817	JFK	15:00	NRT	07:45 next day	3 h 45	9 h 45 turnaround at JFK
812	NRT	14:30	DTW	05:10 previous day	3 h 40	6 h 45 turnaround at Narita
811	DTW	15:00	NRT	07:40 next day	3 h 40	9 h 50 turnaround at DTW
802	NRT	12:20	LAX	23:50 previous day	3 h 30	4 h 40 turnaround at Narita
823	LAX	15:45	SEL	11:15 next day	3 h 30	15 h 55 layover at LAX
830	SEL	15:30	DTW	06:10 same day	3 h 40	4 h 15 turnaround at Gimpo

So the presumption that amazing speeds of an HST would lead to equally amazing productivity improvements is invalidated: average daily fleet utilization comes to just 8 hours 29 minutes per aircraft; even worse if limited to just the Tokyo sectors. Given the schedule-driven necessity of subsonic connections for many East Asian markets, as well as operating hour restrictions at key North American airports, a Mach 5 aircraft in the 1990s just would not have delivered the benefits Mr. Horn was advocating (confirming what aviation historian Ron Davies argued in his book *Supersonic (airliner) Non-Sense*). For prestige and marketing it would have excelled - but alas would have never been profitable.





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Just landed: the *complete* Air West system timetable collection
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